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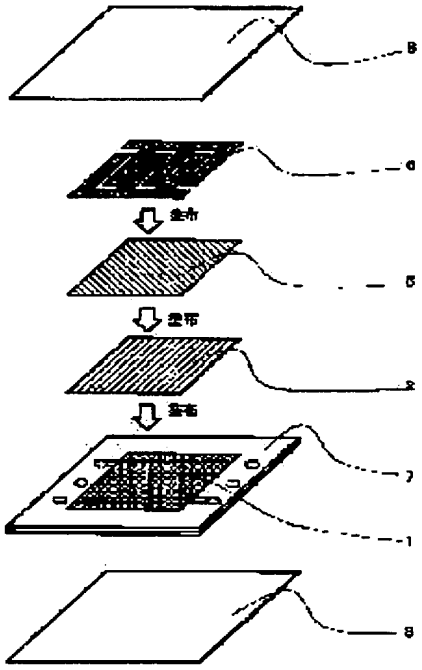
(54) SOLID HIGH POLYMER ELECTROLYTE FUEL CELL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an inexpensive and compact solid high polymer electrolyte fuel cell.

SOLUTION: A gas diffusing layer 5 is formed by applying conductive paste on a membrane electrode complex having a catalyst layer 2 formed by screen printing method on a solid high polymer electrolyte membrane 1 covered by a frame-shaped resin sheet 7, a rib 6 to structure a gas passage is then formed on it by applying the conductive paste, and a separator is placed on it to form an unit cell.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The solid-state polyelectrolyte mold fuel cell characterized by being formed in a solid-state polyelectrolyte mold fuel cell equipped with the single cel constituted by both the external surface of membrane electrode complex by allotting a gaseous diffusion layer, a gas-passageway configuration member, and a separator one by one when said gas-passageway configuration member applies conductive paste material to the front face of said gaseous diffusion layer.
[Claim 2] The solid-state polyelectrolyte mold fuel cell characterized by being formed in a solid-state polyelectrolyte mold fuel cell equipped with the single cel constituted by both the external surface of membrane electrode complex by allotting a gaseous diffusion layer, a gas-passageway configuration member, and a separator one by one when said gas-passageway configuration member applies conductive paste material to the front face of said separator.
[Claim 3] The solid-state polyelectrolyte mold fuel cell characterized by being formed in a solid-state polyelectrolyte mold fuel cell according to claim 1 or 2 when said gaseous diffusion layer applies conductive paste material to the front face of the electrode of said membrane electrode complex.
[Claim 4] The solid-state polyelectrolyte mold fuel cell characterized by having the passage for refrigerants formed by carrying out the laminating of said two or more single cels, and becoming in a solid-state polyelectrolyte mold fuel cell according to claim 1 to 3, and applying conductive paste material to the separator between all single cels and single cels, or the separator for every two or more single cels.
[Claim 5] The solid-state polyelectrolyte mold fuel cell with which the aforementioned conductive paste material is characterized by being formed from the mixture of resin and carbon powder in a solid-state polyelectrolyte mold fuel cell according to claim 1 to 4.
[Claim 6] The solid-state polyelectrolyte mold fuel cell characterized by preparing the mixture of the aforementioned thermoplastics and carbon powder using a drainage system solvent, an organic system solvent, the mixed solvent of the both sides, or the thing that added the surface active substance to these one in a solid-state polyelectrolyte mold fuel cell according to claim 5.
[Claim 7] The solid-state polyelectrolyte mold fuel cell with which the aforementioned resin is characterized by the thing of the thermoplastics, such as a fluororesin, polyethylene terephthalate resin, polyethylene resin, polypropylene resin, Nylon, polycarbonate resin, polyacetal resin, methacrylate resin, and ABS plastics, consisted of any one at least in a solid-state polyelectrolyte mold fuel cell according to claim 5 or 6.
[Claim 8] The solid-state polyelectrolyte mold fuel cell with which the aforementioned resin is characterized by the thing of the thermosetting resin, such as phenol resin, melanin resin, and an epoxy resin, consisted of any one at least in a solid-state polyelectrolyte mold fuel cell according to claim 5 or 6.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the solid-state polyelectrolyte mold fuel cell which uses the solid-state polyelectrolyte film as an electrolyte layer.
[0002]
[Description of the Prior Art] Drawing 5 is the sectional view showing the configuration of the single cel which is the minimum generation-of-electrical-energy unit of the solid-state polyelectrolyte mold fuel cell generally used. Membrane electrode complex (MEA;Membrane Electrode Assembly) joins the catalyst bed 2 containing noble metals to both sides of the solid-state polyelectrolyte film 1, and is formed in them. The gaseous diffusion layer 3 which consists of carbon paper is matched for the outside of membrane electrode complex with the separator 4. A separator 4 plays the role which tells the current acquired by the generation-of-electrical-energy reaction while carrying out conduction of fuel gas and the oxidant gas to the gas passageway with which the gaseous diffusion layer 5 was equipped by facing.
[0003] In performing a generating mode in this single cel, as shown in drawing 6 , a collecting electrode plate 11 is arranged on the outside of the separator 4 of a cel, and an end plate 12 is further arranged on that outside, and it binds tight with a stud 13 and a nut 14, and uses. By supplying the air as oxidant gas to a cathode, and supplying the hydrogen as fuel gas to an anode, electrochemical reaction occurs in a cel and electrical energy is obtained from an external source of supply. The obtained electrical energy is taken out outside by the collecting electrode plate 11. The unreacted gas which was not used for electrochemical reaction is discharged as air exhaust gas and fuel exhaust gas outside, respectively. Moreover, since generation of heat follows on electrochemical reaction, temperature control of a cel is performed by carrying out circulation supply of the water stored in the cooling water system with a circulating pump.
[0004] In addition, the electrical potential difference obtained in one cel is a low value with which 1V are not filled. Therefore, when you need a high electrical potential difference, the laminating of many cels is carried out, it considers as series connection electrically, and the stack structure which arranged the collecting electrode plate and the end plate on the outside is used.
[0005]
[Problem(s) to be Solved by the Invention] The separator 4 is equipped with the passage for reactant gas conduction in the above-mentioned cel configuration. For this reason, the separator 4 is manufactured by the approach of machining and forming carbon material, the approach of carrying out mold shaping of the carbon material, or the approach of carrying out press working of sheet metal of the metal plate. Moreover, carbon paper and a carbon cross are used for the gaseous diffusion layer 3.
[0006] For this reason, with the configuration like the above, since manufacture of a cel takes many manufacture processes and high processing of cost is moreover needed, there is a trouble that the solid-state polyelectrolyte mold fuel cell of low cost cannot be obtained.
[0007] Moreover, with the configuration like the above, since it is necessary to make a separator 4 into what has thickness thick to some extent in order to equip one with the passage for reactant gas conduction, reduction of the thickness of a cel is restrained and there is a difficulty that the thing with thin thickness for which a compact cel is constituted is difficult. The purpose of this invention cancels these difficulties, and it is low cost and it is to offer a compact solid-state polyelectrolyte mold fuel cell.
[0008]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, it sets to this invention.

In a solid-state polyelectrolyte mold fuel cell equipped with the single cel constituted by both the external surface of membrane electrode complex by allotting a gaseous diffusion layer, a gas-passageway configuration member, and a separator one by one (1) The above-mentioned gas-passageway configuration member on the front face of a gaseous diffusion layer, or the front face of a separator For example, thermoplastics, such as a fluororesin, polyethylene terephthalate, and polyethylene, Or the mixture of thermosetting resin, such as phenol resin and melamine resin, and carbon powder Suppose that it forms by applying a drainage system solvent, an organic system solvent, the mixed solvent of the both sides, or the conductive paste material prepared and obtained using what added the surface active substance to these.

[0009] (2) Moreover, suppose that the above-mentioned gaseous diffusion layer is formed by applying the same conductive paste material as the above (1) to the front face of the electrode of membrane electrode complex.

(3) Suppose that the passage for refrigerants is formed in what carries out the laminating of further two or more single cels, and constitutes them by applying the same conductive paste material as the above (1) to the separator between all single cels and single cels, or the separator for every two or more single cels.

[0010] Since the gas passageway of a suitable configuration can form easily by applying conductive paste material to the front face of a plate-like gaseous diffusion layer, or the front face of a plate-like separator like the above (1) then, it is not necessary to have the separator in which a gas passageway like drawing 5 was formed. Therefore, plate-like sheet metal is sufficient as a separator, and since it can also form a gas passageway thinly, it can constitute a cel with thin thickness. Moreover, since special processing is not needed for manufacture of a separator, it can manufacture by low cost.

[0011] Moreover, since a cel can be manufactured according to forming a gaseous diffusion layer and forming the passage for refrigerants like the above (3) further like the above (2), then the consistent process, manufacture cost can be reduced. Moreover, since a gaseous diffusion layer and the passage for refrigerants are formed by spreading, adjustment of thickness is easy and the reduction of the thickness of a cel of it is attained.

[0012]

[Embodiment of the Invention] <Example 1> drawing 1 is the decomposition perspective view showing the manufacture approach of the single cel of the 1st example of the solid-state polyelectrolyte mold fuel cell of this invention. **** cel It is the cell which has the electrode surface product of 2 50cm, and the fabrication sequence is as follows. first, the solid-state polyelectrolyte film 1 -- core 71mm x 71mm it covered with the resin sheet 7 of the shape of a frame equipped with the opening, the periphery of the solid-state polyelectrolyte film 1 and the frame section of the resin sheet 7 were pasted up with the binder of a silicon system, and the gas leakage to a side edge was prevented -- it bowed down and the electrolyte membrane was manufactured. Subsequently, it is 71mm x 71mm to the electrolyte membrane part of the center section of this resin sheet 7. The catalyst bed 2 of the platinum base with breadth was formed with screen printing. Then, it is abbreviation by screen printing on a catalyst bed 2 about the paste which mixed the particle of carbon, polytetrafluoroethylene (PTFE), and polyethylene terephthalate at a rate of 2:1:1, and added, prepared and manufactured water and a surfactant. It applied to the thickness of 0.1mm, it heated to 140 **, and the gaseous diffusion layer 5 was formed. Subsequently, it is height abbreviation by applying with screen printing on the catalyst bed 2 of both sides of the membrane electrode complex (MEA) which mixed the particle of carbon, PTFE, and polyethylene terephthalate at a rate of 3:1:2, added and prepared water and a surfactant, manufactured the paste, and was formed like the above. The 0.4mm rib 6 for a gas-passageway configuration was formed. Furthermore, it gold-plated on it. SUS316 The becoming separator 8 has been arranged and between the frame section of the resin sheet 7 and these separators 8 was pasted up with the adhesives of a silicon system. thus, the thickness of the manufactured single cel -- about -- It is 1.2mm and the very thin single cel was obtained.

[0013] Thus, hydrogen gas and air are supplied to the manufactured single cel, and according to the result of having examined the I-V property, current density It sets to 0.5 A/cm2 and is a generated voltage. 650mV was shown and the property equivalent to the conventional single cel of the configuration of drawing 5 was acquired.

[0014] <Example 2> drawing 2 is the decomposition perspective view showing the manufacture approach of the single cel of the 2nd example of the solid-state polyelectrolyte mold fuel cell of this invention. Also **** cel Having the electrode surface product of 2 50cm, the fabrication sequence is as

follows. First, membrane electrode complex was manufactured by the same approach as an example 1, and the gaseous diffusion layer 6 was formed by the same, same approach as an example 1 on it. Subsequently, it gold-plated. SUS316 It is height abbreviation by applying the paste which mixed the particle of carbon, PTFE, and polyethylene terephthalate at a rate of 3:1:2 to the becoming separator 8, and added, prepared and manufactured water and a surfactant to it with screen printing. The 0.4mm rib 6 for a gas-passageway configuration was formed. After it, it has arranged and the laminating of the separator 8 equipped with the membrane electrode complex equipped with the gaseous diffusion layer 5 and a rib 6 was carried out so that the gaseous diffusion layer 5 and a rib 6 might face, the frame section and the separator 8 of the resin sheet 7 of membrane electrode complex were pasted up with the adhesives of a silicon system, and the single cel was constituted.

[0015] Hydrogen gas and air are supplied to this single cel, and according to the result of having examined the I-V property, current density 0.5 A/cm2 It sets and is a generated voltage. 650mV was shown and the property equivalent to the conventional single cel of the configuration of drawing 5 or the single cel of the example 1 of drawing 1 was acquired.

[0016] <Example 3> drawing 3 is the decomposition perspective view showing the manufacture approach of the fuel cell layered product of the 3rd example of the solid-state polyelectrolyte mold fuel cell of this invention. Single cel 10 manufactured by the approach shown in the example 1 SUS316 On the becoming separator 8, the particle of carbon, PTFE, and polyethylene terephthalate is mixed at a rate of 3:1:2, the paste which added, prepared and manufactured water and a surfactant is applied with screen printing, and it is height abbreviation. Rib 6A for a 0.4mm cooling water passage configuration was formed. Subsequently, after arranging the same resin sheet 7A as the frame-like resin sheet 7 used for the perimeter of rib 6A in the example 1 and the example 2, in order to prevent gas leakage, separator 8 adjoining comrade was pasted up with silicon system adhesives. Thickness is abbreviation by this approach. The 35-sheet laminating of the thin single cel 10 which is 1.2mm was carried out, the compact fuel cell layered product was constituted, after having arranged the collecting electrode plate 11 and the end plate 12 to both ends and binding tight like drawing 8 using a stud 13 and a nut 14, hydrogen gas and air were supplied and the generation-of-electrical-energy experiment was conducted. According to the result, it is a horsepower output. 800W were obtained. This value is the outstanding property equivalent to the thing using the fuel cell layered product which carried out the laminating of the conventional single cel of the configuration of drawing 5 .

[0017] In addition, although the paste which mixed the particle of carbon, PTFE, and polyethylene terephthalate to formation of the gaseous diffusion layer 6 or formation of Ribs 6 and 6A, and added, prepared and manufactured water and a surface active agent to them is used in the above-mentioned examples 1-3, PTFE and polyethylene terephthalate are good also as other thermoplastics with the same property, for example, polyethylene terephthalate resin, polyethylene resin, polypropylene resin, Nylon, polycarbonate resin, polyacetal resin, methacrylate resin, ABS plastics, etc. Moreover, it is good also as using thermosetting resin, such as phenol resin, melanin resin, and an epoxy resin. Moreover, although water and a surfactant are added, prepared and manufactured, it is good for the mixed solvent of an organic system solvent or an organic system solvent, and a drainage system solvent, or these also as preparing using what added the surface active substance. Furthermore, although the prepared paste was applied with screen printing in the above-mentioned example, it is good also as replacing with this and applying with the slip casting method or a spray method.

[0018]

[Effect of the Invention] As mentioned above, according to this invention, it sets to a solid-state polyelectrolyte mold fuel cell equipped with the single cel constituted by both the external surface of membrane electrode complex by allotting a gaseous diffusion layer, a gas-passageway configuration member, and a separator one by one. (1) The above-mentioned gas-passageway configuration member on the front face of a gaseous diffusion layer, or the front face of a separator For example, thermoplastics, such as a fluororesin, polyethylene terephthalate, and polyethylene, Or the mixture of thermosetting resin, such as phenol resin and melanin resin, and carbon powder Since it forms by applying a drainage system solvent, an organic system solvent, the mixed solvent of the both sides, or the conductive paste material prepared and obtained using what added the surface active substance to these Since a separator and a gas-passageway configuration member can constitute in a thin shape extremely, manufacture is easy and a man day is shortened, it is low cost and a compact solid-state polyelectrolyte mold fuel cell will be obtained.

[0019] (2) Moreover, since a cel can be formed at forming the above-mentioned gaseous diffusion layer

by applying the same conductive paste material as the above (1) to the front face of the electrode of membrane electrode complex, then the consistent process, it is low cost and suitable as a compact solid-state polyelectrolyte mold fuel cell.

[0020] (3) In what carries out the laminating of further two or more single cels, and constitutes them The separator between all single cels and single cels, Or if the passage for refrigerants is formed by applying the same conductive paste material to the separator for every two or more single cels Furthermore, since a fuel cell layered product can manufacture consistently and the passage for refrigerants can be formed in a thin shape, it is low cost and much more suitable as a compact solid-state polyelectrolyte mold fuel cell.

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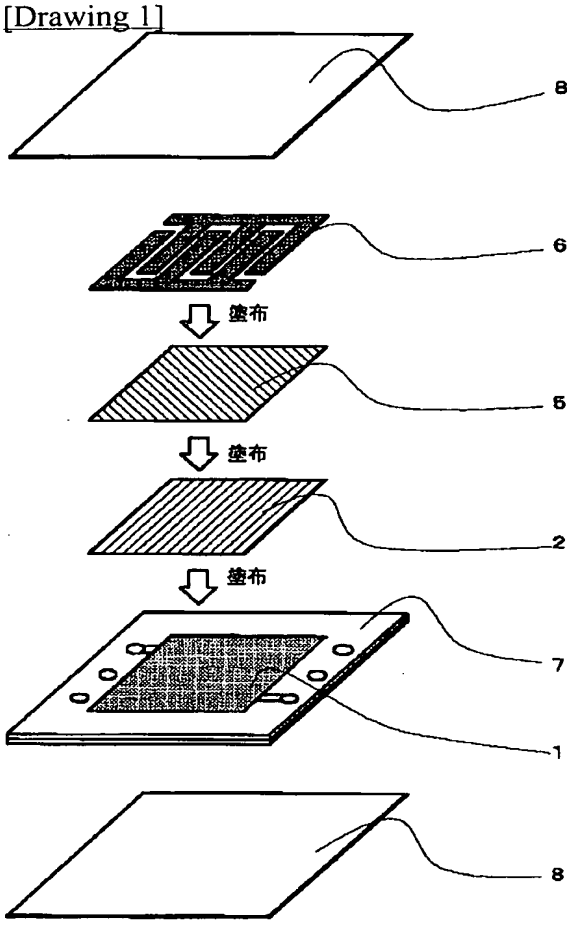
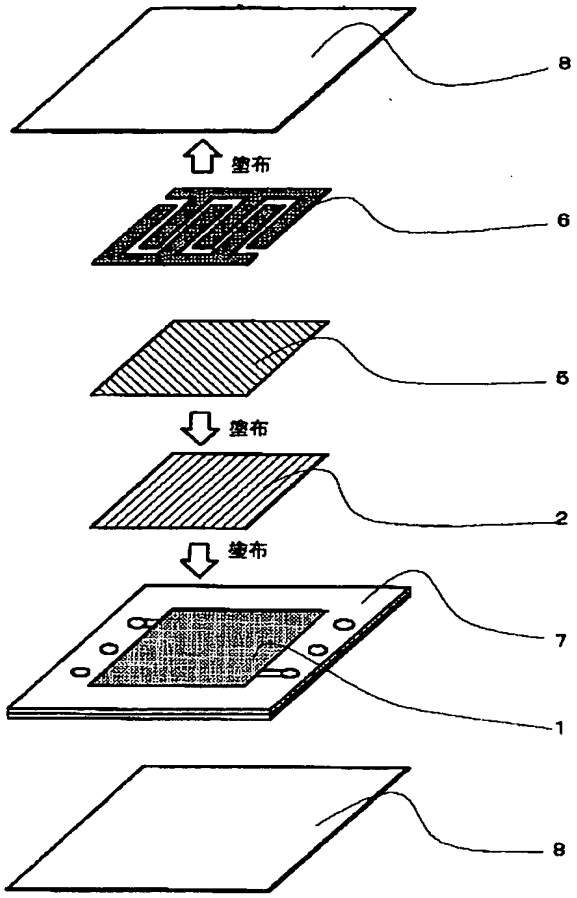
* NOTICES *

DRAWINGS

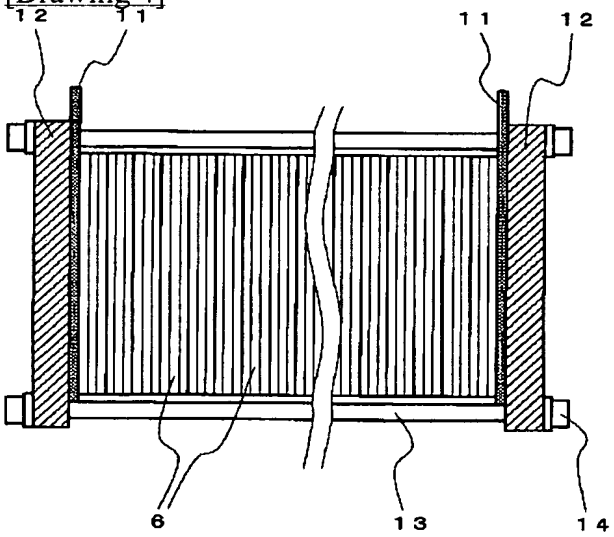
[Drawing 1]



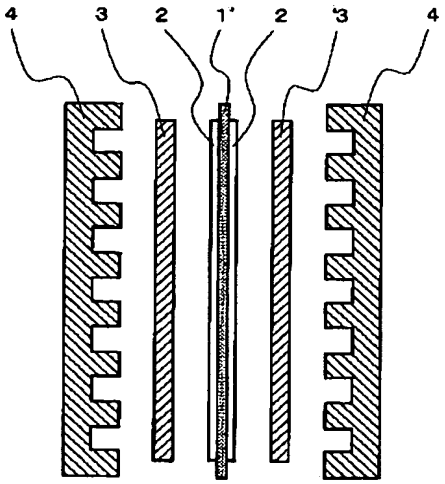
[Drawing 2]



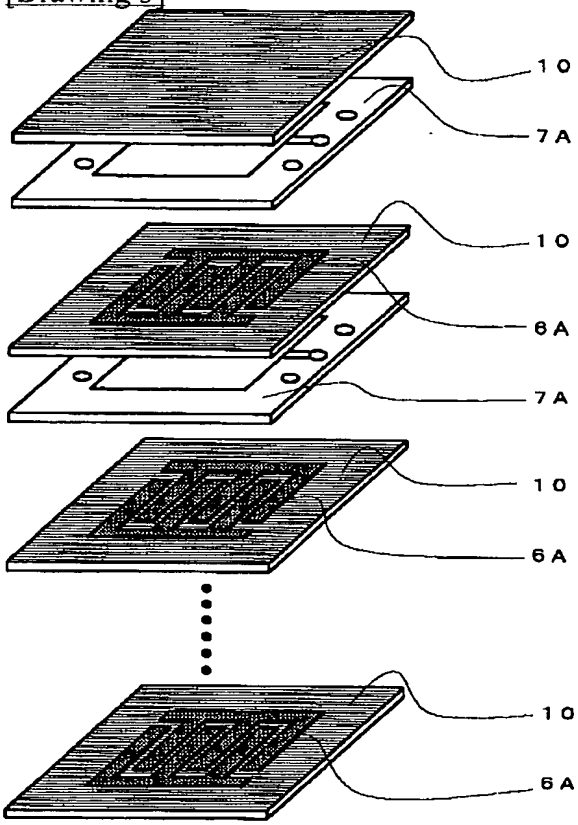
[Drawing 4]



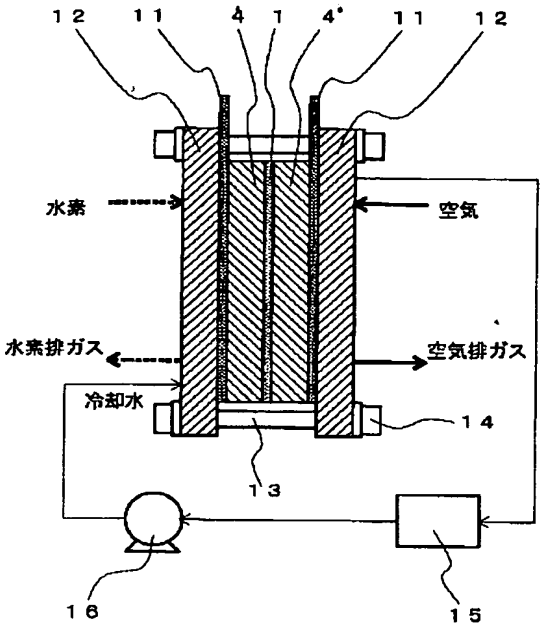
[Drawing 5]



[Drawing 3]



[Drawing 6]



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